

EXPERIMENT STATION
OF THE
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN.

BULLETIN No. 74—JULY 1897.

FARM DEPARTMENT.

C. C. GEORGESON, M. S.,
Professor of Agriculture and Superintendent of Farm.
F. C. BURTIS, M. S., Assistant.
D. H. OTIS, M. S., Assistant.

EXPERIMENTS WITH OATS.

THE season has on the whole been favorable to the oat crop. The field experiments are of the same nature as those reported in Bulletin No. 63. The following is the series:

- I. OATS ON LAND FALL PLOWED, SPRING PLOWED, AND NOT PLOWED.
- II. TIME OF SEEDING OATS.
- III. EFFECT OF QUALITY OF SEED.
- IV. METHODS OF SEEDING OATS.
- V. AMOUNT OF SEED OATS TO THE ACRE.
- VI. SUBSOILING vs. SURFACE-PLOWING FOR OATS.
- VII. EFFECT OF PACKING FALL-PLOWED LAND FOR OATS.
- VIII. EFFECT OF PACKING SPRING-PLOWED LAND FOR OATS.
- IX. "CERES PULVER" AS A REMEDY FOR SMUT.
- X. TEST OF VARIETIES.

The size and number of the plats and their arrangement are in accordance with the plan which has been followed for several years; *i.e.*, unless otherwise specified, the plats are one-twentieth of an acre in size, and there are five in each series under the same treatment, so distributed as to balance, as far as possible, any inequality in the soil.

Table I.
OATS ON LAND FALL PLOWED, SPRING PLOWED, AND NOT PLOWED.
Plats one-twentieth of an acre.

Plat No.	TREATMENT OF GROUND AND METHOD OF SEEDING.	Yield of plat.		Rate per acre.	
		Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
1	Ground spring plowed, seed drilled in.....	54	127	33.75	1.27
2	“ fall plowed, seed drilled in.....	54	81	33.75	.81
3	“ not plowed, seed drilled in.....	39	36	24.37	.36
4	“ not plowed, seed cultivated in.....	58	93	36.25	.93
5	“ not plowed, seed disked in.....	56	45	35.00	.45
6	“ disked, seed drilled in.....	68	113	42.50	1.13
7	“ not plowed, seed listed in.....	55	72	34.37	.72
8	“ spring plowed, seed drilled in.....	67	85	41.87	.85
9	“ fall plowed, seed drilled in.....	55	65	34.37	.65
10	“ not plowed, seed drilled in.....	69	92	43.12	.92
11	“ not plowed, seed cultivated in.....	57	74	35.62	.74
12	“ not plowed, seed disked in.....	78	98	48.75	.98
13	“ disked, seed drilled in.....	72	89	45.00	.89
14	“ not plowed, seed listed in.....	93	102	58.12	1.02
15	“ spring plowed, seed drilled in.....	65	75	40.62	.75
16	“ fall plowed, seed drilled in.....	82	100	51.25	1.00
17	“ not plowed, seed drilled in.....	84	107	52.50	1.07
18	“ not plowed, seed cultivated in.....	47	73	29.37	.73
19	“ not plowed, seed disked in.....	64	86	40.00	.86
20	“ disked, seed drilled in.....	76	80	47.50	.80
21	“ not plowed, seed listed in.....	74	96	46.50	.96
22	“ spring plowed, seed drilled in.....	74	82	46.25	.82
23	“ fall plowed, seed drilled in.....	74	112	46.25	1.12
24	“ not plowed, seed drilled in.....	50	109	31.25	1.09
25	“ not plowed, seed cultivated in.....	45	67	28.12	.67
26	“ not plowed, seed disked in.....	40	56	25.00	.56
27	“ disked, seed drilled in.....	61	90	38.12	.90
28	“ not plowed, seed listed in.....	49	67	30.62	.67
29	“ spring plowed, seed drilled in.....	64	106	40.60	1.06
30	“ fall plowed, seed drilled in.....	43	63	26.87	.63
31	“ not plowed, seed drilled in.....	42	49	26.25	.49
32	“ not plowed, seed cultivated in.....	32	52	24.37	.52
33	“ not plowed, seed disked in.....	37	54	23.12	.54
34	“ disked, seed drilled in.....	41	69	25.62	.69
35	“ not plowed, seed listed in.....	43	63	26.87	.63
AVERAGES: Ground spring plowed, seed drilled in.....				40.49	.95
“ fall plowed, seed drilled in.....				33.49	.85
“ not plowed, seed drilled in.....				35.49	.78
“ not plowed, seed cultivated in.....				29.74	.71
“ not plowed, seed disked in.....				34.37	.67
“ disked, seed drilled in.....				39.74	.88
“ not plowed, seed listed in.....				39.30	.80

SUMMARY OF AVERAGES FOR EIGHT YEARS.

TREATMENT OF GROUND AND METHOD OF SEEDING.	Rate of yield per acre, in bushels.								
	Total average.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.
Spring plowed, seed drilled in.....	31.11	40.49	19.49	15.48	24.81	36.75	20.56	57.81	33.50
Fall plowed, seed drilled in.....	31.20	38.49	17.18	12.52	24.62	34.93	.....	59.47	.....
Not plowed, seed drilled in.....	25.48	35.49	17.93	14.49	24.75	33.06	18.16	.....	34.52
Not plowed, seed cultivated in.....	26.36	30.74	13.30	12.93	24.31	33.31	14.06	52.72	29.55
Not plowed, seed disked in.....	22.07	34.37	13.93	14.32	25.68	.....	.....	.....	.....
Disked, seed drilled in.....	24.09	39.74	17.49	16.41	22.75	.....	.....	.....	.....
Not plowed, seed listed in.....	24.60	39.30	16.24	13.97	26.50	.....	.....	.....	.....

AVERAGES FOR FIVE YEARS.

TREATMENT OF GROUND AND METHOD OF SEEDING.	Rate of yield per acre, in bushels.					
	Five years' average.	1897.	1896.	1895.	1894.	1893.
Ground spring plowed, seed drilled in.....	27.40	40.49	19.49	15.48	24.81	36.75
“ fall plowed, seed drilled in.....	25.54	38.49	17.18	12.52	24.62	34.93
“ not plowed, seed drilled in.....	25.14	35.49	17.93	14.49	24.75	33.06
“ not plowed, seed cultivated in.....	22.91	30.74	13.30	12.93	24.31	33.31

I. OATS ON LAND FALL PLOWED, SPRING PLOWED, AND NOT PLOWED.

There were 35 plats in this experiment, comprising the following methods of treatment:

- A. Spring plowed, seed drilled.
- B. Fall plowed, seed drilled.
- C. Not plowed, seed drilled.
- D. Not plowed, seed cultivated in.
- E. Not plowed, seed disked in.
- F. Ground disked, seed drilled in.
- G. Not plowed, seed planted with a lister drill.

The fall-plowed plats were plowed November 25 to a depth of about eight inches, and at once leveled off with the Acme harrow. The spring-plowed plats were plowed March 1 to a depth of eight inches. All plats were seeded March 15, the spring and fall plowed being first thoroughly harrowed. The results are stated in table I.

It will be seen that the average results are in favor of spring plowing for the past season, but in the average for eight years there is practically no difference between spring and fall plowing. In the average of the five last years, the results are decidedly in favor of spring plowing.

II. TIME OF SEEDING OATS.

This experiment is designed to bring out the relative merits of early and late seeding. The experiment comprises 45 plats. The original plan was to make the first seeding March 2, but the ground was so water-logged at that date that this seeding could not be made, and, the plats having been staked out, two plats were seeded March 16 in each place where it was originally intended to have only one. The plats were seeded with Pedigree Red Rust Proof oats, with a shoe press drill, at the rate of three bushels per acre. The results are detailed in table II.

It will be noticed that, with a single exception, the averages of yields of the five plats show a regular falling off each successive seeding after the first, and in the summary of averages for five years,

if we omit the seeding of March 1, which occurred only two of the years, there is in like manner a regular falling off in the yield with each seeding after that of March 9. In this region oats should be sown in the early part of March for the best results.

Table II.
TIME OF SEEDING OATS. Plats, one-twentieth of an acre.

DATE OF SEEDING.	Height of stalk, foot ..	Length of head, inch's.	Date of heading.	Date when rip's.	Yield of plat.		Rate per acre.	
					Grain, lbs. ..	Straw, lbs. ..	Grain, bus..	Straw tons.
Mar. 9.....	2.6	6.2	May 31.....	June 23.....	60	76	37.50	.76
" 16.....	2.3	6.0	June 2.....	" 24.....	50	81	31.25	.81
" 16.....	2.3	5.8	" 2.....	" 24.....	39	157	24.37	1.57
" 25.....	2.1	5.5	" 6.....	" 27.....	32	72	20.00	.72
" 30.....	1.9	5.5	" 9.....	" 29.....	41	65	25.62	.65
Apr. 6.....	1.8	5.0	" 14.....	July 2.....	16	30	10.00	.30
" 13.....	1.9	5.0	" 18.....	" 7.....	17	54	10.62	.54
" 20.....	1.7	4.3	" 25.....	" 12.....	17 ¹	53 ¹	10.93	.53
" 27.....	1.7	4.3	" 30.....	" 12.....	10	61	6.25	.61
Mar. 9.....	2.6	6.6	May 31.....	June 23.....	59	111	36.87	1.11
" 16.....	2.5	6.2	June 2.....	" 24.....	57	84	35.62	.84
" 16.....	2.4	6.0	" 2.....	" 24.....	53	83	33.12	.83
" 25.....	2.2	5.6	" 6.....	" 27.....	48	83	30.00	.83
" 30.....	2.0	5.0	" 9.....	" 29.....	53	98	33.12	.98
Apr. 6.....	2.0	4.8	" 14.....	July 2.....	32	58	20.00	.58
" 13.....	1.8	4.6	" 18.....	" 7.....	18 ¹	92 ¹	11.56	.92
" 20.....	1.9	4.3	" 25.....	" 12.....	16	100	10.00	1.00
" 27.....	1.8	4.1	" 30.....	" 12.....	17	99	10.62	.99
Mar. 9.....	2.8	6.9	May 31.....	June 23.....	70	120	43.75	1.20
" 16.....	2.9	6.7	June 2.....	" 24.....	81	150	50.62	1.50
" 16.....	2.7	6.4	" 2.....	" 24.....	74	112	46.25	1.12
" 25.....	2.5	6.0	" 6.....	" 27.....	72	114	45.00	1.14
" 30.....	2.3	5.2	" 9.....	" 29.....	70	91	43.75	.91
Apr. 6.....	2.2	5.1	" 14.....	July 2.....	39	121	24.37	1.21
" 13.....	1.8	4.9	" 18.....	" 7.....	23	88	14.37	.88
" 20.....	1.6	4.4	" 25.....	" 12.....	18 ¹	82 ¹	11.56	.82
" 27.....	1.5	4.3	" 30.....	" 12.....	18	118	11.25	1.18
Mar. 9.....	2.6	6.5	May 31.....	June 23.....	55	91	34.37	.91
" 16.....	2.4	6.1	June 2.....	" 24.....	48	67	30.00	.67
" 16.....	2.0	5.5	" 2.....	" 24.....	47	64	29.37	.64
" 25.....	2.2	5.3	" 6.....	" 27.....	48	78	30.00	.78
" 30.....	1.9	4.9	" 9.....	" 29.....	40	56	25.00	.56
Apr. 6.....	2.0	4.7	" 14.....	July 2.....	23	53	14.37	.53
" 13.....	1.6	4.6	" 18.....	" 7.....	.....	.....	.....	.....
" 20.....	1.5	4.4	" 25.....	" 12.....	15	65	9.37	.65
" 27.....	1.5	4.4	" 30.....	" 12.....	17	55	10.62	.55
Mar. 9.....	2.7	6.4	May 31.....	June 23.....	60	96	37.50	.96
" 16.....	2.7	6.1	June 2.....	" 24.....	66	89	41.25	.89
" 16.....	2.4	6.0	" 2.....	" 24.....	71 ¹	118 ¹	44.68	1.18
" 25.....	2.2	5.6	" 6.....	" 27.....	55	90	34.37	.90
" 30.....	2.1	5.4	" 9.....	" 29.....	57	108	35.62	1.08
Apr. 6.....	2.1	5.2	" 14.....	July 2.....	37	79	23.12	.79
" 13.....	2.0	5.0	" 18.....	" 7.....	23	93	14.37	.93
" 20.....	2.0	4.7	" 25.....	" 12.....	21	95	13.12	.95
" 27.....	2.0	4.6	" 30.....	" 12.....	24	127	15.00	1.27
AGES: Mar. 9...	2.6	6.5	May 31.....	June 23.....	.....	.....	37.99	.99
" 16.....	2.6	6.2	June 2.....	" 24.....	.....	.....	37.74	.94
" 16.....	2.3	5.9	" 2.....	" 24.....	.....	.....	35.55	1.06
" 25.....	2.2	5.6	" 6.....	" 27.....	.....	.....	31.87	.87
" 30.....	2.0	5.1	" 9.....	" 29.....	.....	.....	32.62	.83
Apr. 6.....	2.0	4.9	" 14.....	July 2.....	.....	.....	18.37	.68
" 13.....	1.8	4.8	" 18.....	" 7.....	.....	.....	12.73	.81
" 20.....	1.7	4.4	" 25.....	" 12.....	.....	.....	10.99	.79
" 27.....	1.7	4.3	" 30.....	" 12.....	.....	.....	10.74	.92

Thrown out on account of wash.

SUMMARY OF AVERAGES FOR FIVE YEARS.

Date of seeding.			Rate of yield per acre, in bushels.					
1897.	1896.	1895, 1894, and 1893.	Total av.	1897.	1896.	1895.	1894.	1893.
Mar. 9.....	Mar. 2.....	Mar. 1.....	24.49	.....	38.37	10.62	†.....	.....
" 18.....	" 9.....	" 8.....	31.10	37.99	33.93	10.49	†.....	37.00
" 25.....	" 16.....	" 15.....	26.92	36.65	30.12	8.81	22.56	36.50
" 30.....	" 23.....	" 22.....	22.68	31.87	22.55	9.43	18.06	31.50
Apr. 6.....	" 30.....	" 29.....	21.13	32.62	11.80	10.49	21.37	29.37
" 13.....	Apr. 6.....	Apr. 5.....	15.02	18.37	5.30	11.75	15.63	24.00
" 20.....	" 13.....	" 12.....	12.51	12.73	3.37	8.57	15.33	22.50
" 27.....	" 20.....	" 19.....	12.69	10.99	*.....	5.53	17.02	17.25
	" 27.....	" 26.....	9.92	10.74	*.....	3.42	14.21	11.31
		May 3.....	8.26	.....	.....	.....	11.66	4.87

*Total failure. †Frozen out.

III. EFFECTS OF QUALITY OF SEED.

The experiment of grading seed with a view to ascertain the relative value of light, common and heavy seed has now been tested for eight successive seasons, with the results in favor of the heavy seed. The past season the heavy seed shows up relatively better than in any previous year. The seed is graded on the fanning-mill. The common grade is the seed as it comes from the thrasher, and the light and heavy is obtained by fanning; but each grade was taken from the same grade respectively of the crop of 1896. The variety used was the Red Georgia. All plats were seeded March 27 with a shoe press drill at the rate of three bushels per acre by measure. The seed of the light and common grades was poor, the crop of 1896 not having been a good one. To show the number of stalks of each grade in a certain

Table III.

EFFECTS OF QUALITY OF SEED. Plats, one-twentieth of an acre.

Plat No.	GRADE OF SEED.	No. of stalks in 20 ft. of row April 19.....	No. of stalks in 20 ft. of row June 18.....	Yield of plat.		Rate per acre.	
				Grain, pounds..	Straw, pounds..	Grain, bushels..	Straw, tons.....
17	Light.....	414	472	56	115	35.00	1.15
18	Common.....	375	478	75	96	46.87	1.96
19	Heavy.....	514	596	84	106	52.50	1.06
20	Light.....	343	419	64	111	40.00	1.11
21	Common.....	287	420	74	107	46.25	1.07
22	Heavy.....	607	651	74	92	46.25	.92
23	Light.....	415	456	49	91	30.62	.91
24	Common.....	248	289	60	91	37.50	.91
25	Heavy.....	433	487	70	84	45.75	.81
26	Light.....	304	393	41	84	25.62	.84
27	Common.....	314	406	53	78	33.12	.73
28	Heavy.....	537	531	65	78	40.62	.76
29	Light.....	310	360	57	89	35.62	.89
30	Common.....	385	620	56	80	35.00	.80
31	Heavy.....	674	719	74	86	46.25	.86
AVERAGES: Light.....		357½	417	.....	.....	33.37	.98
Common.....		322	462½	.....	.....	29.74	.86
Heavy.....		559	596½	.....	.....	45.87	.86

SUMMARY OF AVERAGES FOR EIGHT YEARS.

GRADE OF SEED.	Rate of yield per acre, in bushels.								
	Total ave'ge.	1897.	1898.	1895.	1894.	1893.	1892.	1891.	1890.
Light.....	27.50	33.37	15.74	24.37	18.31	34.12	21.87	50.63	21.12
Common.....	29.89	39.74	20.24	26.82	18.06	41.37	23.59	45.27	24.03
Heavy.....	30.90	45.87	18.80	25.48	17.56	38.75	26.40	46.44	29.94

length of row, 20 feet of row were measured off, and the stalks counted April 19 and June 18. The results are shown in table III.

It will be seen that the heavy seed had decidedly the greater number of stalks. This undoubtedly accounts to a large degree for the difference in yield.

IV. METHODS OF SEEDING OATS.

The 25 plats devoted to this experiment were plowed in December and seeded March 16. The methods of seeding comprise broadcasting, seeding with hoe drill, seeding with shoe drill with press wheels, seeding with shoe drill without press wheels, and seeding with a lister drill. The Red Georgia was the variety used, and the plats were

Table IV.

METHODS OF SEEDING OATS. Plats, one-twentieth of an acre.

Plat No.	METHOD OF SEEDING.	Yield of plat.		Rate per acre.	
		Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
36	Broadcast.....	59	101	36.57	1.01
37	Hoe drill.....	54	63	33.75	.83
38	Shoe drill with press wheels.....	89	111	59.00	1.11
39	Shoe drill without press wheels.....	75	94	46.87	.94
40	Listed.....	73	137	45.62	1.37
41	Broadcast.....	45	65	28.12	.68
42	Hoe drill.....	65	91	40.62	.91
43	Shoe drill with press wheels.....	71	90	44.37	.90
44	Shoe drill without press wheels.....	72	108	45.00	1.08
45	Listed.....	80	91	50.00	.91
46	Broadcast.....	79	112	49.37	1.12
47	Hoe drill.....	74	97	46.25	.97
48	Shoe drill with press wheels.....	88	119	53.75	1.19
49	Shoe drill without press wheels.....	75	125	46.87	1.25
50	Listed.....	71	100	44.37	1.00
51	Broadcast.....	71	125	44.37	1.25
52	Hoe drill.....	71	95	44.37	.95
53	Shoe drill with press wheels.....	62	109	38.75	1.09
54	Shoe drill without press wheels.....	66	134	41.25	1.34
55	Listed.....	57	89	35.62	.89
56	Broadcast.....	40	56	25.00	.56
57	Hoe drill.....	63	88	39.37	.88
58	Shoe drill with press wheels.....	72	74	45.00	.74
59	Shoe drill without press wheels.....	74	101	46.25	1.01
60	Listed.....	58	73	36.25	.73
AVERAGES: Broadcast.....				36.74	.82
Hoe drill.....				40.87	.86
Shoe drill with press wheels.....				46.37	1.00
Shoe drill without press wheels.....				45.24	1.12
Listed.....				42.37	.93

seeded at the rate of three bushels per acre. The results are shown in table IV.

It will be seen that the press shoe drill gave the best yield. In like manner, the average of seven years gives the best result to this drill, and the least to broadcasting.

SUMMARY OF AVERAGES FOR SEVEN YEARS.

METHOD OF SEEDING.	Rate of yield per acre, in bushels.							
	Total average.	1897.	1896.	1895.	1894.	1893.	1892.	1891.
Broadcast	26.24	36.74	16.06	7.93	26.37	28.18	24.87	43.56
Hoe drill.....	28.34	40.87	19.99	7.50	26.18	28.88	29.60	45.99
Shoe drill with press wheels.....	31.54	46.37	22.87	11.03	22.43	31.25	35.06	51.73
Shoe drill without press wheels..	30.01	45.24	21.24	9.03	25.12	32.81	26.60	50.64
Listed	31.05	42.37	19.74					

Table V.

AMOUNT OF SEED OATS TO THE ACRE. Plats, one-twentieth of an acre.

Plat No.	RATE OF SEEDING PER ACRE.	No. of stalks in 20 ft. of row April 19.	No. of stalks in 20 ft. of row June 18.	Yield of plat.		Rate per acre.	
				Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
112.....	1.0 bushels.....	168	331	69	107	43.12	1.07
113.....	1.5 "	273	505	71	85	44.37	1.35
114.....	2.0 "	372	503	80	116	50.00	1.16
115.....	2.5 "	476	598	87	83	54.37	.83
116.....	3.0 "	551	621	88	112	55.00	1.12
117.....	3.5 "	609	613	89½	90½	55.93	.90
118.....	4.0 "	726	708	84	106	52.50	1.06
119.....	1.0 "	165	346	62	94	38.75	.94
120.....	1.5 "	311	463	81	96	50.62	.96
121.....	2.0 "	451	513	77	113	48.12	1.13
122.....	2.5 "	486	562	66	84	41.25	.84
123.....	3.0 "	476	586	79	131	49.37	1.31
124.....	3.5 "	501	624	86	105	53.75	1.05
125.....	4.0 "	750	741	88	188	55.00	1.88
126.....	1.0 "	218	500	63	88	39.37	.88
127.....	1.5 "	334	477	81	104	50.62	1.04
128.....	2.0 "	503	600	92	113	57.50	1.13
129.....	2.5 "	534	618	92½	111½	57.81	1.11
130.....	3.0 "	550	618	92	110	57.50	1.10
131.....	3.5 "	647	749	91	109	56.87	1.09
132.....	4.0 "	743	733	87	133	54.37	1.33
133.....	1.0 "	171	414	66	95	41.25	.95
134.....	1.5 "	334	549	74	107	46.25	1.07
135.....	2.0 "	481	582	78	92	48.75	.92
136.....	2.5 "	538	496	76	115	47.50	1.15
137.....	3.0 "	610	640	80½	95½	50.31	.95
138.....	3.5 "	665	659	80	106	50.00	1.06
139.....	4.0 "	826	787	87	88	54.37	.88
140.....	1.0 "	208	383	82	123	51.25	1.23
141.....	1.5 "	304	443	76	119	47.50	1.19
142.....	2.0 "	422	512	83	128	51.87	1.28
143.....	2.5 "	504	587	89	107	55.62	1.07
144.....	3.0 "	529	706	92	114	57.50	1.14
145.....	3.5 "	748	838	99	112	61.87	1.12
146.....	4.0 "	729	714	94	127	58.75	1.27
Averages,	1.0 bushels.....	186	404½			42.74	1.01
"	1.5 "	311½	488½			47.87	1.02
"	2.0 "	445½	542			51.24	1.12
"	2.5 "	507½	572½			51.31	1.00
"	3.0 "	543½	634½			53.93	1.12
"	3.5 "	634	696½			55.63	1.04
"	4.0 "	754½	736½			54.99	1.28

V. AMOUNT OF SEED OATS TO THE ACRE.

This experiment comprises 35 plats, and the amount seeded per acre varies by half a bushel from one to four bushels. The land was plowed in December, and the plats seeded March 18 with shoe press drill. The Red Georgia was the variety used. The number of stalks in a given length of row were ascertained, first, after the oats were well up and again June 18, just before the crop ripened. The table shows that there is almost a constant increase in the number of stalks corresponding to the increase in the amount of seed. There is, in like manner, an increase in the yield with an increase in the amount of seed up to three and one-half bushels to the acre, but in the averages for the past seven years four bushels per acre make the best showing, while there is no difference between seedings of from two and a half to three and a half bushels.

SUMMARY OF AVERAGES FOR SEVEN YEARS.

RATE OF SEEDING PER ACRE.	Rate of yield per acre in bushels.							
	Total aver- age.	1897.	1896.	1895.	1894.	1893.	1892.	1891.
1.0 bushels	24.65	42.74	11.62	13.59	22.31	30.31	20.78	31.25
1.5 "	27.87	47.87	14.81	15.17	23.35	30.93	28.79	34.19
2.0 "	29.12	51.24	15.55	12.85	18.12	30.75	32.03	43.26
2.5 "	30.86	51.31	17.18	13.18	23.93	30.93	34.36	45.12
3.0 "	30.43	53.93	18.93	10.79	20.54	32.25	31.76	44.84
3.5 "	30.43	55.63	18.37	8.61	19.50	31.12	34.26	45.50
4.0 "	32.79	54.99	20.06	7.77	19.60	33.25	47.63	46.25

VI. SUBSOILING vs. SURFACE-PLOWING FOR OATS.

The subsoiled land used in this experiment was in corn in 1896, and it was subsoiled for the corn crop. The preparation for the oat crop consisted simply in surface-plowing in December, 1896, and harrowing before seeding. The plats were larger than usual, each containing nearly a third of an acre. They were seeded with Belgian oats March 17, with the shoe press drill. The results are shown in table VI.

It will be seen that in this case, also, the surface-plowed plats gave a slightly better yield than the subsoiled plats — a result similar to that obtained in our experiments in subsoiling for wheat.

VII. EFFECT OF PACKING FALL-PLOWED LAND FOR OATS.

The object of this experiment was to ascertain the value, if any, which would result from the use of Campbell's subsurface packer on fall-plowed land. The plats were plowed in December, at which time a liberal coat of barn-yard manure was plowed under. The manure was rather coarse and it was expected that it would prevent the proper settling of the soil, but owing to the wet winter the settling

Table VI.
 SUBSOILING vs. SURFACE-PLOWING FOR OATS. Plats, 38½ x 36½ feet.

Plat No.	TREATMENT.	Yield of plat.		Rate per acre.	
		Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
106	Subsoiled, 1895.....	552½	707½	53.96	1.10
107	Surface-plowed.....	571½	752½	55.31	1.17
108	Sub-soiled, 1895.....	606	755	58.92	1.17
109	Surface-plowed.....	522½	902½	51.03	1.40
110	Sub-soiled, 1895.....	479½	844½	46.80	1.31
111	Surface-plowed.....	539½	640½	52.69	.99
AVERAGES: Subsoiled, 1895.....				52.56	1.19
Surface-plowed.....				53.17	1.18

was more thorough than it would otherwise have been. There were three sets of plats packed, respectively, once, three times, and not at all. With the weights and driver, the packer weighed 1,950 pounds. After having been prepared, all plats were drilled April 3 with a shoe press drill, Burt's Extra Early being the variety used. The results are shown in table VII.

There was, in this case, no difference in the yields between plats packed three times and those packed only once, both yielding nearly alike; but the plats not packed at all yielded about four bushels less than those on which the packer had been used.

Table VII.
 EFFECT OF PACKING FALL-PLOWED LAND FOR OATS.
 Plats, one-twentieth of an acre.

Plat No.	TREATMENT.	Yield of plat.		Rate per acre.	
		Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
1	Not packed.....	54	80	33.75	.80
2	Packed once.....	59	96	36.37	.96
3	Packed three times.....	56	95	35.60	.95
4	Not packed.....	51	80	31.87	.80
5	Packed once.....	56	70	35.00	.70
6	Packed three times.....	56	75	35.00	.75
7	Not packed.....	30	80	18.75	.80
8	Packed once.....	47	53	29.37	.58
9	Packed three times.....	47	91	29.37	.91
10	Not packed.....	40	58	25.00	.58
11	Packed once.....	38	49	23.75	.49
12	Packed three times.....	31	40	19.37	.40
13	Not packed.....	29	57	18.12	.57
14	Packed once.....	35	50	21.87	.50
15	Packed three times.....	44	62	27.50	.62
AVERAGES: Not packed.....				25.49	.71
Packed once.....				29.37	.64
Packed three times.....				29.24	.72

VIII. EFFECT OF PACKING SPRING-PLOWED LAND FOR OATS.

An exactly similar experiment was tried on spring-plowed land, with this difference: that the ground had not been manured as in the former case. In other respects, the method of treatment and the variety used were the same. The results show a still greater difference in favor of the packer, the plats not packed averaging 22.24 bushels per acre; those packed once, 27.87; and those packed three times, 29.37.

These results are decidedly in favor of the use of this new machine, and the difference is all the more remarkable from the fact that the rainfall had been abundant and the crop had at no time lacked moisture. Presumably, the difference would be still greater in a dry or unfavorable season, the object of the machine being to compact the soil so as to retain moisture better; or rather to prevent a too rapid evaporation of the moisture in the soil.

Table VIII.

Plats, one-twentieth of an acre.

Plat No.	TREATMENT.	Yield of plat.		Rate per acre.	
		Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
1	Packed once	53	68	36.25	.68
2	Not packed	54	76	33.75	.76
3	Packed three times	60	61	37.50	.61
4	Packed once	40	41	25.00	.41
5	Not packed	34	27	21.25	.27
6	Packed three times	59	72	36.87	.72
7	Packed once	45	39	28.12	.39
8	Not packed	32	54	20.00	.54
9	Packed three times	36	41	22.50	.41
10	Packed once	40	47	25.00	.47
11	Not packed	23	8	14.37	.08
12	Packed three times	34	41	21.25	.41
13	Packed once	40	36	25.00	.36
14	Not packed	35	31	21.87	.31
15	Packed three times	46	55	23.75	.55
AVERAGES: Packed once				27.87	.46
Not packed				22.24	.39
Packed three times				29.37	.54

SUMMARY OF AVERAGES FOR 1897.

TREATMENT.	Rate of yield per acre, in bushels.		
	Average.	On spring-plowed land.	On fall-plowed land.
Not packed	23.86	22.24	25.49
Packed once	28.62	27.87	29.37
Packed three times	29.30	29.37	29.24

IX. "CERES PULVER" AS A REMEDY FOR SMUT.

Ceres powder (pulver) is a fungicide recently put upon the market by a Danish scientist. The directions state that 3.2 ounces of the powder should be dissolved in about 10 quarts of water, and that this solution is sufficient for treating 100 pounds of grain. The solution is sprinkled upon the grain, while the latter is shoveled over and over until it is completely and thoroughly moistened. The object of the treatment is to kill the smut spores which may adhere to the seed.

The present experiment is not entirely satisfactory, in that the powder came too late to seed the oats in proper time. The variety used was the Lincoln. All plats were seeded April 10, at the rate of three bushels to the acre. The results, as detailed in table IX, show that there is a very decided decrease in the amount of smut in the crop, but the treated plats nevertheless showed nearly 5.5 per cent. of smutted heads. The yields are light because of the late seeding, poor soil, and the influence of the smut.

Table IX.
 EFFECT OF "CERES PULVER" IN DESTROYING SMUT ON OATS.
 Plats, one-twentieth of an acre.

Plat No.	TREATMENT.	Per cent. smutted heads.	Yield of plat.		Rate per acre.	
			Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
16	Treated	3.84	11	25	6.87	.25
17	Not treated	12.89	7	34	4.37	.34
18	Treated	7.30	16	55	10.00	.55
19	Not treated	25.10	11	25	6.87	.25
20	Treated	5.00	6	25	3.75	.25
21	Not treated	19.10	11	50	6.87	.50
AVERAGES: Treated		5.33	.....	.....	6.87	.35
Not treated		19.03	.....	.....	6.03	.36

X. TEST OF VARIETIES

Our variety tests are not and never have been entirely satisfactory. It is impossible to get land enough, entirely uniform in quality, so as to repeat each variety a number of times as we repeat the treatment of certain plats in other experiments; and a single plat of each variety is unsatisfactory because of the variation in the soil and in other conditions which it is impossible to control. It is only when the same varieties are tested year after year in a protracted series that it is possible to get data which will enable one to give a reasonably correct judgment of the merits of the several varieties compared. In the present case the land was not entirely uniform, although it was almost level; but the variations of the same variety on different plats is in

some instances so great that it is evident that there is a marked inequality in the soil.

Table XI gives the average as well as the yearly record for seven years, in which a number of varieties have been tested. While this list is probably not arranged according to actual merit, it shows, nevertheless, that certain varieties are persistently near the top while certain other varieties are as persistently near the bottom in a comparison of yields.

Table X gives the results for the present year.

Table X.

TEST OF VARIETIES. Plats, one-twentieth of an acre.

Plat No.	VARIETY.	When headed.	When ripe.	Height of stalk, ft.	Length of head, in.	Yield of plat.		Rate per acre.	
						Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
2	Belgian	June 11	June 29	3.4	8.6	76	95	47.50	.85
3	Golden Sheaf	" 13	" 30	3.1	6.3	73	118	45.62	1.18
4	Burt's Extra Early Rust Proof.	May 25	" 22	3.0	5.5	57	94	35.62	.94
5	Superior Scotch	June 13	" 30	4.1	8.1	51	105	31.87	1.05
6	Black Russian	" 5	" 27	3.1	6.7	93	118	61.25	1.18
7	South Carolina Black	" 6	" 30	3.2	6.9	123½	157½	77.18	1.57
8	Negro Wonder	" 12	" 30	3.2	7.0	94	177	58.75	1.77
9	Pedigree Red Rust Proof.	" 4	" 27	3.0	6.8	129	147	80.62	1.47
10	Red Rust Proof	" 4	" 27	3.4	6.5	124	166	77.50	1.66
11	Red Georgia	" 4	" 27	3.5	6.4	113	127	70.62	1.27
12	Red Winter	" 6	" 30	3.3	8.0	103	143	64.37	1.43
13	Texas Red (College '98)	" 5	" 28	3.2	6.9	109	131	68.12	1.31
14	Belgian	" 10	" 29	3.6	8.4	105	170	65.62	1.70
15	Golden Sheaf	" 13	July 2	3.7	7.0	100	164	62.50	1.64
16	Stowell's	" 17	" 9	4.0	9.0	54	225	33.75	2.25
17	Northwestern White	" 16	" 6	3.5	6.8	62	163	38.75	1.63
18	Black American	" 13	" 2	3.4	7.5	89	162	55.62	1.62
19	Board of Trade	" 15	" 3	3.7	7.8	76	178	47.50	1.78
20	White Superior	" 16	" 4	3.7	7.7	75	178	46.87	1.78
21	New Seneca Chief	" 15	" 4	3.8	7.6	77	176	48.12	1.76
22	White Swede	" 14	" 4	3.8	8.0	74½	187½	46.56	1.87
23	Great Northern	" 14	" 4	3.7	7.5	76½	139½	47.81	1.39
24	Giant Side	" 19	" 10	3.8	9.3	51	192	31.87	1.92
25	Lincoln	" 16	" 6	3.7	8.2	60½	150½	37.81	1.59
26	Belgian	" 10	June 29	3.4	8.0	61	134	38.12	1.34
27	Golden Sheaf	" 13	July 2	3.6	7.4	93	125	61.25	1.25
28	Colorado Yellow	" 13	" 5	3.7	7.5	66	115	41.25	1.15
29	Probsteir	" 13	" 4	3.8	7.7	68	160	42.50	1.60
30	White Schonen	" 13	" 4	3.7	8.1	72	182	45.00	1.82
31	Yankee Prolific	" 13	" 4	4.0	8.3	71	151	44.37	1.51
32	Surprise	" 15	" 5	3.8	8.5	57	153	35.62	1.53
33	White Side	" 13	" 4	3.6	8.6	64½	149½	40.31	1.49
34	American Banner	" 15	" 5	3.8	7.8	63	163	42.50	1.63
35	Blue Grazing Winter	" 12	June 30	3.7	6.7	73	144	45.62	1.44
36	Race Horse	" 16	July 5	3.9	8.0	61	165	34.12	1.65
37	Mammoth Cluster	" 13	June 30	3.8	8.1	76	150	47.50	1.50
38	Belgian	" 10	" 29	3.5	8.3	80	116	50.00	1.16
39	Golden Sheaf	" 13	July 2	3.8	7.8	92	114	57.50	1.14
40	New Swedish	" 20	" 11	4.0	9.0	40½	183½	25.31	1.83
41	New Goanette Black	" 16	" 2	2.9	6.5	41	150	25.62	1.50
42	Black Mammoth Cluster	" 19	" 10	3.4	8.1	35	182	21.87	1.82
43	Welch	" 14	" 2	3.6	7.4	69	142	43.12	1.42
44	Vick's American Banner	" 16	" 5	3.3	6.3	55	131	34.37	1.31
45	Burt's Extra Early Rust Proof.	May 25	June 22	3.1	5.5	60	84	37.50	.84
46	Brown Winter (mixed crop, '94)	June 11	" 30	3.6	7.0	107	132	66.87	1.32
47	Prince Edward's Island Black	" 20	July 11	3.4	8.9	36	193	29.50	1.93
48	Belgian	" 10	June 29	3.6	7.5	85	121	53.12	1.21
49	Golden Sheaf	" 13	" 30	3.4	7.2	99	127	61.87	1.27
50	Winter Turf	" 20	July 11	3.2	7.0	35½	170½	22.18	1.70
51	Belgian	" 10	June 29	3.5	6.8	97	114	60.62	1.14
52	Missouri White	" 17	July 2	3.6	7.0	34½	91½	43.12	1.13
53	Scrub	" 12	" 1	3.5	7.8	35	66	43.75	1.32
61	Mixed Oats	" 9	June 30	3.4	7.0	39	49	43.75	.89

TABLE X—CONCLUDED.

Plat No.....	VARIETY.	When headed.	When ripe.	Height of stalk, ft.	Length of head, in.	Yield of plat.		Rate per acre.	
						Grain, lbs.	Straw, lbs.	Grain, bus.	Straw, tons.
62	White Oats.....	June 17	July 10	3.8	8.5	35	96	43.75	1.92
63	Great American.....	" 14	" 6	3.5	8.5	46	85	57.50	1.80
64	Mexican Gray.....	" 12	" 2	3.3	7.6	42	74	52.50	1.48
65	Green Mountain.....	" 16	" 6	3.4	8.2	33	102	41.25	2.04
66	Great White Abundance.....	" 14	" 5	3.7	7.8	34	95	42.50	1.90
67	Danish Island Oats.....	" 16	" 5	3.8	8.0	31	110	38.75	2.20
68	Mexican Gray.....	" 12	" 2	3.7	7.3	40	89	50.00	1.72
69	Great American.....	" 15	" 6	3.6	8.1	43	118	53.75	2.36
70	Green Mountain.....	" 16	" 6	3.4	7.5	38	93	47.50	1.86
71	Abundance (Ontario).....	" 14	" 4	3.3	7.1	47	53	58.75	1.16
72	Banner (Ontario).....	" 16	" 6	3.3	6.5	41	97	51.25	1.94
73	Bavarian (Ontario).....	" 16	" 6	3.6	7.0	31	101	42.50	2.02
74	Early Golden Prolific (Ontario).....	" 15	" 5	3.6	7.0	40	76	50.00	1.52
75	Holstein Prolific (Ontario).....	" 15	" 5	3.5	6.1	44½	83½	55.62	1.67
76	Mennonite.....	" 14	" 2	3.3	6.8	38	100	47.50	2.00
77	Belgian (check).....	" 9	June 29	3.0	6.2	51	65	63.75	1.20
AVERAGES OF SIMILAR PLATS:									
	Belgian.....	June 10	June 29	3.5	7.9	.....	.....	52.49	1.25
	Golden Sheaf.....	" 13	July 1	3.5	7.1	.....	.....	57.74	1.29
	Burt's Extra Early Rust Proof.....	May 25	June 22	3.0	5.5	.....	.....	38.56	.89
	Great American.....	June 14	July 6	3.5	8.3	.....	.....	55.62	2.13
	Mexican Gray.....	" 12	" 2	3.5	7.4	.....	.....	51.25	1.63
	Green Mountain.....	" 16	" 6	3.4	7.8	.....	.....	44.37	1.95

Table XI.
VARIETIES OF OATS ARRANGED ACCORDING TO AVERAGE YIELD.

VARIETY.	Average of 7 years.		1897.		1896.		1895.		1894.		1893.		1892.		1890.	
	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....	Rate per acre, in bushels....	Rank.....
Texas Red.....	46.87	1	68.12	5	25.02	4	16.01	34	43.81	3	23.88	12	53.79	3	45.90	1
Pedreg Red Rust Proof.....	41.46	2	80.62	7	16.25	27	16.01	34	43.81	3	23.88	12	53.79	3	45.90	1
Red Winter.....	40.23	3	64.37	8	16.09	28	25.77	5	42.96	4	27.81	15	41.61	23	45.00	3
Red Georgia.....	40.00	4	70.62	4	26.87	2	23.43	14	37.00	9	31.78	4	46.08	20	35.50	15
Red Rust Proof.....	39.89	5	77.50	2	21.37	5	23.43	14	37.00	9	31.78	4	46.08	20	35.50	15
Brown Winter.....	39.74	6	66.87	6	26.87	3	17.57	29	40.83	5	29.10	11	57.09	5	39.00	7
Belgian.....	39.23	7	52.40	15	23.81	6	21.71	18	48.92	1	38.59	2	50.25	42	37.00	10
South Carolina Black.....	38.25	8	77.18	3	19.37	18	18.74	25	31.45	14	38.09	2	47.42	19	32.50	18
Golden Spear.....	37.90	9	57.71	11	21.81	10	23.84	12	38.71	8	27.57	10	52.42	9	43.00	4
Board of Trade.....	36.95	10	47.50	22	21.25	12	23.82	13	37.00	10	36.25	3	53.59	4	34.30	16
Black American.....	35.49	11	55.02	12	19.68	17	32.02	6	39.13	6	43.78	20	49.75	15	38.50	9
White Star.....	35.15	12	40.31	40	23.43	8	24.60	11	36.58	11	32.81	6	55.75	7	32.00	17
Vandalay.....	34.80	13	38.75	41	15.00	32	24.09	8	45.09	2	32.16	5	59.71	2	27.00	24
Waukeego Frolic.....	34.40	14	44.37	29	20.62	15	24.80	10	31.05	21	31.65	7	51.43	11	36.00	11
Welch.....	33.95	15	43.12	33	19.05	21	22.65	15	27.22	27	23.56	13	56.77	6	40.30	6
Probstair.....	33.42	16	42.50	35	18.43	23	26.17	3	27.65	26	23.08	14	46.04	22	45.10	2
White Salmon.....	33.24	17	45.00	28	17.50	24	30.85	2	27.22	28	26.55	18	49.40	16	36.20	13
Negro Wonder.....	33.12	18	58.75	9	20.62	16	19.99	23	31.47	20	22.67	22	42.22	25	42.20	5
Black Russian.....	32.55	19	61.25	8	15.00	33	13.07	37	31.47	20	22.67	22	42.22	25	42.20	5
New Seneca Chief.....	32.43	20	43.12	20	19.37	19	22.65	16	32.75	16	27.06	17	48.98	17	28.10	20
Race Horse.....	31.91	21	38.12	43	18.75	22	25.38	6	34.03	15	31.61	8	50.04	13	25.50	23
Surprise.....	31.70	22	35.62	46	21.25	13	22.65	17	31.90	19	23.09	21	51.83	10	35.60	14
White Superior.....	31.36	23	46.87	25	14.06	34	25.38	7	39.13	7	32.16	5	59.96	1	28.00	19
White Swede.....	31.12	24	46.56	26	15.63	29	19.53	24	27.22	29	20.05	25	59.96	1	28.00	19
Burt's Extra Early Rust Proof.....	31.11	25	36.56	45	30.93	1	11.62	38	28.75	23	20.15	10	44.62	24	36.40	12
Colorado Yellow.....	31.07	26	41.25	39	20.93	14	24.99	9	30.20	22	23.69	20	45.06	23	33.00	8
Vick's American Banner.....	31.07	27	34.37	47	16.56	26	21.09	21	28.50	24	31.00	9	46.40	21	33.00	8
Great Northern.....	30.63	28	47.81	21	19.37	20	20.70	22	34.88	12	31.88	12	46.40	21	33.00	8
Mammoth Cluster.....	29.86	29	47.50	23	15.93	30	26.17	4	34.88	12	31.88	12	46.40	21	33.00	8

SUMMARY.

1. In regard to the comparative value of spring-plowed, fall-plowed ground and ground not plowed, for oats, we have for five years in succession, without a variation, obtained the highest yields from spring-plowed ground. The yield averaged 27.4 bushels per acre, which is about two bushels more than obtained from either of the other methods. The average yield of oats on fall-plowed ground is but very little better than the yield on ground not plowed at all; and the yield on ground not plowed—the seed sown broadcast and covered with a cultivator—is poorest of all. In the other cases the seed was drilled in.

2. As to time of seeding, the experiments for five years past prove that the best yields have been obtained from oats sown either the first or second week in March, and that from this time on till the beginning of May there is a gradual falling off in the yield with each succeeding seeding a week apart. The data show also that oats sown before the middle of March grow taller and have larger panicles than the later seedings.

3. The average results of eight years' experiments with the use of light, common and heavy seed oats show a yield of 30.9 bushels per acre for the heavy, 29.89 for the common, 27.5 for the light seed, respectively. It pays to sow good seed.

4. With experiments with methods of seeding oats, we have results for seven years with the following methods: Broadcast. hoe drill, shoe drill with press wheels, and shoe drill without press wheels. The shoe drill with press wheels has in that period produced an average yield of 31.54 bushels per acre; next comes the shoe drill without press wheels, with 30 bushels per acre; then hoe drill, with 28.34 bushels per acre; and lastly, broadcast, with 26.24 bushels per acre. Not only is the average best for shoe drill with press wheels, but in six out of seven years it has given better yields than any of the other methods.

5. As to the amount of seed oats which it is most profitable to use per acre, the average results for seven years stand as follows: One bushel per acre yielded 24.65 bushels; 1 1/2 bushels, 27.87 bushels; 2 bushels, 29.12 bushels; 2 1/2 bushels, 30.86 bushels; 3 bushels, 30.43 bushels; 3 1/2 bushels, 30.43 bushels; 4 bushels, 32.79 bushels. The results would indicate that 2 1/2 bushels per acre is the most profitable to sow.

6. In an experiment, during the past season only, in which a portion of the land was subsoiled for oats; and another portion surface-plowed in the usual way, and in other respects treated alike, the results are as follows: Subsoiled, 52.56 bushels per acre; surface-plowed, 53.17 bushels. Subsoiling has almost invariably decreased

the yield for both corn, wheat and oats on the College farm. It should be stated that the plats were subsoiled in the fall of 1895.

7. An experiment was tried the present year in packing fall-plowed soil with Campbell's subsurface packer previous to seeding, the packer being run over the plowed ground to settle it. The plats which were not packed yielded at the rate of 25.49 bushels per acre; those packed once, 29.37 bushels; and those packed three times, 29.34 bushels. Here is a gain of nearly four bushels by the use of the packer.

The packing of spring-plowed land for oats gave even better results. The spring-plowed plats not packed yielded 22.24 bushels; those packed once, 27.87 bushels; and those packed three times, 29.37 bushels. The results are decidedly in favor of the use of this implement.

8. The use of "Ceres Pulver" reduced the per cent. of smut in oats from 19.03 to 5.38.

9. In a test of varieties covering a period of seven years, the several varieties of the so-called red oats have, on the whole, given the most satisfactory yields, such as Pedigree Red Rust Proof, Red Rust Proof, Red Georgia, etc.